FORMS OF ENERGY – LESSON PLAN 2.1

Introduction to Forms of Energy

This lesson is designed for 3rd – 5th grade students in a variety of school settings (public, private, STEM schools, and home schools) in the seven states served by local power companies and the Tennessee Valley Authority. Community groups (Scouts, 4-H, after school programs, and others) are encouraged to use it as well. This is one lesson from a three-part series designed to give students an age-appropriate, informed view of energy. As their understanding of energy grows, it will enable them to make informed decisions as good citizens or civic leaders.

This lesson plan is suitable for all types of educational settings. Each lesson can be adapted to meet a variety of class sizes, student skill levels, and time requirements.

Setting	Lesson Plan Selections Recommended for Use
Smaller class size, higher student ability, and /or longer class length	• The "Modeling" Section contains teaching content. • While in class, students can do "Guided Practice," complete the "Recommended Item(s)" and any additional guided practice items the teacher might select from "Other Resources." • NOTE: Some lesson plans do and some do not contain "Other Resources." • At home or on their own in class, students can do "Independent Practice," complete the "Recommended Item(s)" and any additional independent practice items the teacher selects from "Other Resources" (if provided in the plan).
Average class size, student ability, and class length	• The "Modeling" Section contains teaching content. • While in class, students complete "Recommended Item(s)" from "Guided Practice" section. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.
Larger class size, lower student ability, and/or shorter class length	• The "Modeling" Section contains teaching content. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.

Electrical Safety Reminder: Teachers should remind students that electricity is dangerous and that an adult should be present when any recommended activities or worksheets are being completed at home. Always obey instructions on warning labels and ensure one has dry hands when touching electronics or appliances.

Public School System Teaching Standards Covered

State Science Standards

- AL GLE 5.4.1 5th
- KY 4-ET-U-3 4th
- KY SC-5-ET-U-1 5th
- MS 9.a 4th
- MS 9.b 4th
- NC 4.P.3.1 4th
- TN 0407.10.1 4th
- TN GLE 0507.10.1 5th
- TN 0607.10.1 6th
- TN GLE 0607.10.1 6th

Common Core Language Arts/Reading

- ELA.CC4.RI.1,2,and 8 MS, KY, TN, NC 4th
- ELA.CC.RI.1,2,and 4 KY, TN, AL 5th

Performance Objectives

By the end of this lesson, students will be able to:

- **Explain the purpose of electrical energy.**
- **Identify different forms of energy.**
- **Define and explain both kinetic and potential energy.**
- **List forms of both kinetic and potential energy.**

I. Anticipatory Set (Attention Grabber)

Essential Question

How is energy converted into something we can see and use?

Videos

Bill Nye the Science Guy video on energy/electricity: http://www.billnye.com

II. Modeling (Concepts to Teach)

Additional Information

http://www.eia.gov/kids/energy.cfm?page=about_forms_of_energy-basics

Many things are made possible due to people's ability to use energy to do work so that they can live more comfortably. Potential energy is converted to kinetic energy in the form of heat to keep people warm in the winter. Potential energy is converted into kinetic energy in the form of electricity so that people can use their microwave ovens to make popcorn and watch a movie using a DVR player. Potential energy is converted into kinetic energy in the form of light (radiant energy) which allows one to turn on a lamp in order to read a favorite book before going to sleep at night.

There are 9 different forms of energy, but they can all be classified as either Potential Energy or Kinetic Energy:

Potential Energy	Kinetic Energy
Potential energy is stored energy and the energy of position – gravitational energy. There are several forms of potential energy.	**Kinetic energy is motion of waves, electrons, atoms, molecules, substances, and objects.**
Chemical energy is energy stored in the bonds of atoms and molecules. Batteries, biomass, petroleum, natural gas, and coal are examples of stored chemical energy. Chemical energy is converted to thermal energy when wood is burned in a fireplace or gasoline is burned in a car's engine.	**Radiant energy** is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays and radio waves. Light is one type of radiant energy. Sunshine is radiant energy, which provides the fuel and warmth that make life on Earth possible.
Mechanical energy is energy stored in objects by tension. Compressed springs and stretched rubber bands are examples of stored mechanical energy. **Mechanical energy can also be kinetic energy when a moving object (hammer, wind) does work.**	**Thermal energy**, or heat, is the vibration and movement of the atoms and molecules within substances. As an object is heated up, its atoms and molecules move and collide faster. Geothermal energy is the thermal energy in the Earth.
Nuclear energy is energy stored in the nucleus of an atom – the energy that holds the nucleus together. Very large amounts of energy can be released when the nuclei are combined or split apart. Nuclear power plants split the nuclei of uranium atoms in a process called **fission**. The sun combines the nuclei of hydrogen atoms in a process called **fusion**.	**Motion energy** is energy stored in the movement of objects. The faster they move, the more energy is stored. It takes energy to get an object moving, and energy is released when an object slows down. Wind is an example of motion energy. A dramatic example of motion is a car crash, when the car comes to a total stop and releases all its motion energy at once in an uncontrolled instant.
Gravitational energy is energy stored in an object's height. The higher and heavier the object, the more gravitational energy is stored. When someone rides a bicycle down a steep hill and picks up speed, the gravitational energy is being converted to motion energy. Hydropower is another example of gravitational energy, where the dam "piles" up water from a river into a reservoir.	**Sound** is the movement of energy through substances in longitudinal (compression/rarefaction) waves. Sound is produced when a force causes an object or substance to vibrate – the energy is transferred through the substance in a wave. Typically, the energy in sound is far less than other forms of energy.
	Electrical energy is delivered by tiny charged particles called electrons, typically moving through a wire. Lightning is an example of electrical energy in nature, so powerful that it is not confined to a wire.

III. Checking for Understanding

Teachers can ask students these questions to determine understanding of concepts.

REMEMBER	List the forms of potential energy. List the forms of kinetic energy. Give examples of each form. (Teachers can list these on the board with help from students.)
UNDERSTAND	Explain the difference between potential and kinetic energy. (Class discussion)
APPLY	Illustrate potential energy being converted into kinetic energy. (Ex. light bulb → light; Teacher or student turns a light from off to on.)
ANALYZE	Using a Venn diagram, compare and contrast potential and kinetic energy. **http://www.learninggamesforkids.com/graphic_organizers/writing/venn-diagram.html**
CREATE	Create a drawing of something that would have potential and kinetic energy. Explain the difference in captions. (Teachers can ask students to draw their pictures on a sheet of paper. Ex. A ball at the top of a hill.)

IV. Guided Practice Ideas

Recommended Items

Interactive Energy Zone game (see below)

Games

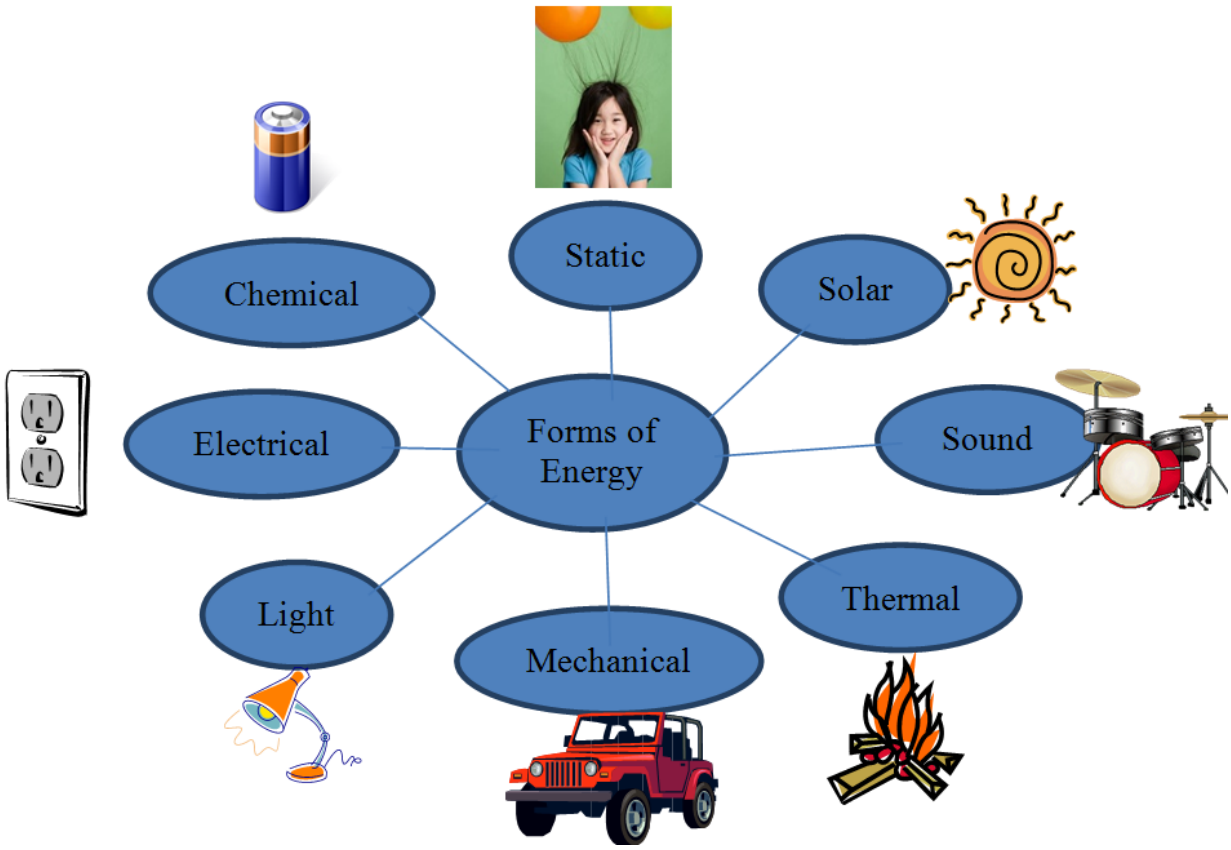
Interactive Game – Energy Zone: **http://www.kidsenergyzone.com/**

Experiments

Beginner electronics, solar energy, how to make a generator, etc.:
http://sciencewithkids.com/Experiments/Energy-Electricity-Experiments/energy-experiments.html

Other Resources

Graphic organizer: The spider graphic organizer below shows forms of energy in the center and kinds of energy as subcategories. Teachers can draw and label the 9 circles in the graphic organizer below on the board. Teachers can then list the 8 examples on the board (hair on end, sun, lamp, drum, fire, car, outlet, battery). Students can come to the board and either match the examples to the subcategory or draw pictures next to each subcategory. For example, lamp goes with light energy. The completed example with pictures is shown below.



Practice that uses reading/language arts standards

Reading: Teachers can have students read an article explaining energy and summarize it on a sheet of paper.

- https://suite.io/harvey-craft/624s2a6
- http://www.nrel.gov/education/pdfs/science_energy_literacy_activities.pdf

V. Independent Practice Ideas

Recommended Item

Scavenger Hunt: Kinds of energy in your home (see below under Practice That May Involve Parents/Guardians)

Other Resources

Personal Practice

- Creative Writing Activity: Teachers write the following questions on the board and ask students to copy and answer the questions on a sheet of paper: What would the world be like if we didn't have electricity? In your opinion, what is the most important form of energy?
- Short Essay: Teachers write the following question on the board and ask students to copy and answer the question in the form of a short essay on a sheet of paper: What is the purpose of electrical energy?
- Where Does Your Electricity Come From? Worksheet: http://www.education.com/files/219501_219600/219567/electricity-sources-functions.pdf

Practice That May Involve Parents/Guardians

- Kinds of Energy in Your Home Worksheet and Answer Key provided.
- **Scavenger Hunt**: Find the different kinds of energy in your home. Students find 5 different types of energy examples in their home and list them on a sheet of paper. (Ex. mechanical energy – ink pen; light energy – flashlight, etc.)

VI. Assessment

These items provide a check for understanding so teachers can easily determine whether concepts need to be reinforced. This item can be graded, if desired.

- Kinds of Energy in Your Home Worksheet and Answer Key provided.

VII. Materials Needed

No materials are needed for the "Recommended Items" in Guided Practice and Independent Practice sections.

VIII. Closing the Lesson

In addition to the Essential Question shown below, teachers can reference Performance Objectives at the top of the Lesson Plan.

Essential Question

How is energy converted into something we can see and use?
(Ex. a flashlight)

WORKSHEET FOR INTRODUCTION TO FORMS OF ENERGY LESSON 2.1

NAME: _____

Kinds of Energy in Your Home

Objective: Students will be able to explain the purpose of electrical energy, identify different forms of energy, and define, explain, and list forms of kinetic and potential energy.

1. **How is potential energy different from kinetic energy?**

_____

_____

_____

_____

2. **Compare and contrast electric energy and motion energy.**

_____

_____

_____

_____

3. **What machines in your home use energy?**

_____

_____

_____

_____

4. **What kind of energy is stored in a stretched rubber band?**

_____

_____

_____

_____

5. **Explain energy transformations that occur in a flashlight.**

_____

_____

_____

_____

Answer Key

ANSWER KEY FOR WORKSHEET: KINDS OF ENERGY IN YOUR HOME

1. **How is potential energy different from kinetic energy?**

   Ex. Potential energy is stored energy and the energy of position. Kinetic energy is energy in motion.

2. **Compare and contrast electric energy and motion energy.**

   Ex. Electric energy is delivered by tiny charged particles called electrons, typically moving through a wire.

   Motion energy is stored in the movement of objects. The faster they move, the more energy is stored. It takes energy to get an object moving.

3. **What machines in your home use energy?**

   Ex. Washer and dryer, dishwasher, refrigerator, video games, etc.

4. **What kind of energy is stored in a stretched rubber band?**

   Ex. Mechanical energy – energy is stored in the rubber band by tension.

5. **Explain energy transformations that occur in a flashlight.**

   Ex. Potential before switched on. Mechanical when switched on (completes the circuit).

   Chemical once wires are connected. Electrical energy, radiant or light, heat or thermal.